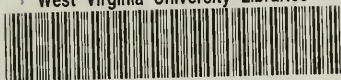


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West Virginia University Agricultural Experiment Station

MORGANTOWN

DEPARTMENT OF SOILS

ANALYSES OF ONE HUNDRED WEST VIRGINIA SOILS



BY

Firman E. Bear and Robert M. Salter

Bulletins and Reports of this Station will be mailed free to any citizen of West Virginia upon written application. Address Director of the West Virginia Agricultural Experiment Station, Morgantown, W. Va.

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†In co-operation with the University of Chicago.

*In co-operation with the United States Department of Agriculture.

CONCLUSIONS.

These conclusions are summarized from the analyses of one hundred samples of West Virginia soils.

1. Fifty percent of these soils contain less than 1000 pounds of phosphorus per acre to a depth of $6\frac{2}{3}$ inches. The use of acid phosphate on such soils would produce a marked increase in their crop-producing power.

2. Over forty percent of these soils contain less than 2500 pounds of nitrogen per acre to a depth of $6\frac{2}{3}$ inches. Heavy yields of most crops cannot be produced on such soils until more nitrogen is present in them. This nitrogen can be secured from the air by growing legumes.

3. Ninety percent of these soils show a need of lime averaging over one ton of limestone per acre. Alfalfa and red clover cannot be grown to advantage on such soils until lime has been applied. Either ground limestone or burned lime can be used to advantage.

4. The amount of organic matter present in these soils is not half what it should be. The organic matter can be increased by growing larger crops and by plowing under cover crops and manure.

5. Eighty percent of these soils contain more than 20,000 pounds of potassium per acre to plow depth. If the other deficiencies in these soils were supplied, there should be sufficient available potassium to prevent its being a limiting factor.

Analyses of One Hundred West Virginia Soils*

By **FIRMAN E. BEAR** and **ROBERT M. SALTER.**

It is the intention of the department of soils of the West Virginia Agricultural Experiment Station to make a study of the most important soil types in every county of the state and to determine the amounts of the various plant food elements contained in them. This bulletin is a preliminary report concerning the most prominent soil series together with the analyses of 100 samples chosen from certain sections of the state.

SOIL SURVEYS OF THE UNITED STATES BUREAU OF SOILS.

The United States Bureau of Soils has been co-operating with the West Virginia Geological Survey in its work in this state. As each area is surveyed as to its mineral content it is also mapped as to its soil types. It has seemed advisable to accept the soil classification as outlined by the Bureau of Soils and to choose our samples as largely as possible from areas which have already been surveyed. Up to the present time one-half of the state has been mapped. The soil surveys are issued under authorization of Congress and the distribution provides 500 copies of each soil survey in the state for each of the senators from the state and 2000 copies of each survey for the congressman representing the district in which the survey is located. Soil surveys are available for the following counties and can be obtained by writing to the senators or to the congressmen representing the various districts:

| | | | |
|-----------|----------|------------|---------|
| Boone | Kanawha | Monongalia | Taylor |
| Brooke | Lincoln | Ohio | Tyler |
| Cabell | Logan | Pleasants | Upshur |
| Calhoun | McDowell | Preston | Wayne |
| Doddridge | Marion | Putnam | Wetzel |
| Hancock | Marshall | Raleigh | Wirt |
| Harrison | Mason | Ritchie | Wood |
| Jackson | Mingo | Roane | Wyoming |

*For methods of analysis see Bulletin 159, West Virginia Agricultural Experiment Station, Morgantown.

Many of the soils, the analyses of which are given in this bulletin, have been chosen from the above named counties and represent definite soil types. Other samples have been chosen from areas which have not yet been surveyed and represent definite soil types which will be classified later when the soil survey of the state has been completed.

The Bureau of Soils* has divided the United States into 13 soil provinces or regions. "A province is an area in which the soils have been produced by the same force or group of forces."

In West Virginia three provinces are represented:

- I. Limestone Valleys and Uplands Province.
- II. Appalachian Mountains and Plateaus Province.
- III. The River Flood Plains Province.

In each province there are several soil series. "A soil series is a group of soils having the same range in color, the same character of subsoil as regards color and structure, the same relief and drainage and a common or similar origin."

The following series are represented in West Virginia in the areas so far surveyed. This does not include the Eastern Panhandle or the soils of the types in Greenbrier and Pocahontas counties.

I. Limestone Valleys and Uplands Province

1. Brooke series

- a. Soils grayish brown to brown.
- b. Subsoils yellowish brown to reddish brown clay.
- c. Soils derived from pure limestone with an occasional admixture of material from sandstone and shales.
- d. Soils with good drainage, fairly productive, easy to cultivate.

2. Hagerstown series (Not surveyed as yet in West Virginia but present in limestone valley section of Greenbrier and Pocahontas and other eastern counties and in the Eastern Panhandle).

- a. Soils prevailing brown in color.
- b. Subsoils light brown to reddish brown.
- c. Soils derived from pure massive limestone.
- d. Soils very productive and suitable for most crops

II. Appalachian Mountains and Plateaus Province

1. Dekalb series

- a. Soils gray to brown.
- b. Subsoils some shade of yellow.

*U. S. Bureau of Soils, Bulletin 96.

- c. Soils derived from sandstone and shales.
- d. Soils generally not very productive. (West Virginia Experiment Station farm is Dekalb soil.)
- 2. Meigs series
 - a. Soils variable in character from gray or pale yellow to red.
 - b. Subsoils variable.
 - c. Soils a mixture of Dekalb and Upshur.
 - d. Soils on hilly areas difficult to cultivate.
- 3. Upshur series
 - a. Soils Indian red.
 - b. Subsoils Indian red.
 - c. Derived from sandstone and shales, frequently calcareous in nature.
 - d. Generally fairly productive.
- 4. Westmoreland series
 - a. Soils grayish brown to yellowish brown.
 - b. Subsoils yellowish to yellowish brown.
 - c. Derived from sandstone and shales with interbedded limestone and calcareous shales.
 - d. Soils very productive.

III. The River Flood Plains Province

A. Terrace Soils

- 1. Elk series
 - a. Soils light brown to brown.
 - b. Yellow subsoils.
 - c. Soils contain limestone, alluvium from Westmoreland series.
 - d. Soils fairly productive.
- 2. Holston series
 - a. Soils yellowish brown to brown.
 - b. Subsoils yellow.
 - c. Soils from sandstone and shale.
 - d. Only fairly productive.
- 3. Tyler series
 - a. Soils gray to grayish brown.
 - b. Subsoils yellowish to mottled yellow and gray.
 - c. Soils largely from sandstone and shale, poorly drained.
 - d. Not very productive.
- 4. Wheeling series
 - a. Soils brown to yellowish brown.
 - b. Subsoils gravelly.
 - c. Soils from glacial material.
 - d. Very productive.

- B. First Bottom Soils
5. Holly series
 - a. Soils gray.
 - b. Subsoils mottled gray and yellow.
 - c. Contain some limestone, poorly drained.
 - d. Not very productive.
 6. Huntington series.
 - a. Soils light brown to brown.
 - b. Subsoils yellow to light brown.
 - c. Contain some limestone.
 - d. Very productive.
 7. Moshannon series
 - a. Soils reddish brown to Indian red.
 - b. Subsoils reddish brown.
 - c. Soils from alluvium from Upshur series.
 - d. Very productive.

Table 1 shows the number of acres belonging to each series in the area so far surveyed.

TABLE 1.—Acres of Land in Various Soil Series
in West Virginia.

| Series | Acres |
|-----------------------|-----------|
| Dekalb | 3,142,536 |
| Meigs | 2,718,848 |
| Rough Stony Land..... | 823,466 |
| Huntington | 360,576 |
| Upshur | 319,744 |
| Westmoreland | 166,080 |
| Holston | 120,512 |
| Moshannon | 62,592 |
| Tyler | 60,672 |
| Brooke | 47,232 |
| Wheeling | 40,770 |
| Elk | 31,872 |
| Holly | 27,520 |
| Miscellaneous | 12,928 |
| Total | 7,935,348 |

In each of these soil series there are several soil types. "A soil type is a soil which throughout the area of its occurrence has the same texture, structure, color, character of sub-soil, general topography, process of derivation, and usually derived from the same material." There may, therefore, be sands, silts, loams, and clays in each of the above series. For example, the soil on the West Virginia Agricultural Experiment Station farm is a Dekalb silt loam.

TABLE II†.—Pounds per 2,000,000 Lbs. of Surface Soil*.

| Sample Number | Owner of Farm | Postoffice | Soil Series | Nitrogen | Phosphorus | Potassium | Carbon | Limestone Required [†] |
|------------------------|--------------------|--------------|------------------|----------|------------|-----------|--------|---------------------------------|
| Barbour County | | | | | | | | |
| 85-A | W. D. Zinn | Philippi | Tyler | 3214 | 835 | 18600 | 35510 | 1800 |
| 90-A | W. D. Zinn | Philippi | ? | 4185 | 1236 | 27400 | 43910 | 3200 |
| 112-A | W. D. Zinn | Philippi | Upshur | 4102 | 1236 | 49600 | 32210 | 1600 |
| Berkeley County | | | | | | | | |
| 24-A | John Miller | Martinsburg | Hagerstown (?) | 2358 | 1631 | 40600 | 19620 | 1000 |
| 25-A | John Miller | Martinsburg | ? | 2433 | 1420 | 51400 | 29120 | 1800 |
| 26-A | Back Creek | Hedgesville | Hagerstown (?) | 1442 | 536 | 23800 | 22010 | 2400 |
| 27-A | Gray Silver | Martinsburg | ? | 2515 | 1150 | 40200 | 24960 | 1400 |
| 28-A | John Miller | Martinsburg | Hagerstown | 2081 | 2020 | 53800 | 15480 | 800 |
| 29-A | Mrs. Lupton | Martinsburg | Hagerstown | 2235 | 1086 | 49000 | 23030 | 0 |
| 30-A | Mr. Aler | Martinsburg | Soapstone | 2478 | 1398 | 39200 | 24960 | 1800 |
| 31-A | A. R. Feltner | Martinsburg | Soapstone & Clay | 1705 | 752 | 21600 | 20310 | 200 |
| 32-A | J. W. Stewart | Tabler | Hagerstown | 2152 | 1282 | 49600 | 21660 | 0 |
| 33-A | D. Gold Miller | Martinsburg | Hagerstown (?) | 2295 | 917 | 108800 | 23950 | 1000 |
| 34-A | Dr. Shipper | Gerrardstown | Hagerstown (?) | 2558 | 1322 | 31200 | 26110 | 3000 |
| 35-A | Geo. Shroades | Gerrardstown | ? | 2602 | 1364 | 39000 | 18150 | 2400 |
| 36-A | H. L. Smith | Arden | ? | 2932 | 1035 | 143000 | 31720 | 1800 |
| 37-A | Gr. Golden Or. Co. | Martinsburg | Hagerstown (?) | 2486 | 1327 | 55000 | 27290 | 2200 |
| 38-A | Senator Silver | Gerrardstown | Hagerstown (?) | 3083 | 1117 | 52600 | 30480 | 0 |
| Brooke County | | | | | | | | |
| 40-A | Robt. Underwood | Wellsburg | Huntington | 5912 | 2648 | 38000 | 67010 | 3000 |
| 42-A | Robt. Patterson | Wellsburg | Brooke | 3646 | 1365 | 48000 | 53010 | 0 |
| 111-A | | Follansbee | Wheeling | 1940 | 1550 | 21600 | | 3600 |
| 114-A | Wm. Brady | Collier | Brooke (?) | 3060 | 1125 | 31200 | 30970 | 2800 |
| Cabell County | | | | | | | | |
| 4-A | Mr. Wilson | Ona | Meigs | 1375 | 588 | 26800 | 19170 | 4400 |

†Credit is due E. B. Wells and M. F. Morgan for assistance in making these analyses.

*This represents the amount of soil in a layer over an acre to a depth of 6 $\frac{1}{2}$ inches.

TABLE II (Continued).—Pounds per 2,000,000 Lbs. of Surface Soil.

| Sample Number | Owner of Farm | Postoffice | Soil Series | Nitrogen | Phosphorus | Potassium | Carbon | Limestone Required't |
|-------------------------------|--------------------|--------------|----------------|----------|------------|-----------|--------|----------------------|
| Cabell County (Cont'd) | | | | | | | | |
| 18-A | Mr. Clark | Ona | Upshur | 2482 | 1218 | 49800 | 21620 | 0 |
| 21-A | Mr. Sios | Ona | Holston | 1537 | 830 | 17600 | 15210 | 1400 |
| 22-A | C. R. Morris | Martha | Holston (?) | 2893 | 2066 | 56600 | 31760 | 1800 |
| 74-A | Perry Lawson | Milton | Dekalb | 1520 | 370 | 17200 | 21210 | 1000 |
| 75-A | J. H. Moore | Milton | Holston (?) | 4344 | 1187 | 35400 | 62970 | 0 |
| 79-A | Ed. Kyle | Coxs Landing | Wheeling | 1824 | 892 | 25600 | 17810 | 2000 |
| 84-A | John White | Culloden | Holston | 1764 | 566 | 14400 | 20230 | 2200 |
| Doddridge County | | | | | | | | |
| 113-A | J. E. Coleman | West Union | Holston (?) | 3240 | 806 | 27800 | 34770 | 1800 |
| Fayette County | | | | | | | | |
| 39-A | B. A. Fleshman | Fayetteville | Dekalb | 1210 | 421 | 11000 | 25370 | 2200 |
| 58-A | L. V. Shawver | Corliss | Dekalb | 3124 | 753 | 18400 | 48280 | 4600 |
| 61-A | T. C. Jones | Oak Hill | Dekalb | 2082 | 483 | 16000 | 30550 | 2400 |
| 65-A | L. P. Wills | Mt. Cove | Dekalb | 2602 | 662 | 11200 | 32450 | 2200 |
| 109-A | J. B. Kesler | Clifty | Dekalb | 3384 | 660 | 20200 | 39490 | 2800 |
| Greenbrier County | | | | | | | | |
| 44-A | L. E. McClung | Rupert | ? | 3116 | 1590 | 22000 | 54270 | 6800 |
| 45-A | J. O. McClung | Rupert | ? | 3680 | 708 | 17000 | 65800 | 4000 |
| 46-A | David Tuckwiller | Lewisburg | Soapstone | 2824 | 1160 | 13800 | 28550 | 2600 |
| 47-A | Rev. H. A. Murrill | Lewisburg | Hagerstown (?) | 2884 | 1289 | 27400 | 26560 | 1200 |
| Harrison County | | | | | | | | |
| 1-A | Fred Whitman | Adamston | Westmoreland | 2930 | 1226 | 42400 | 31330 | 2800 |
| 87-A | Arthur Sheets | Lost Creek | Dekalb | 2750 | 706 | 22000 | 32140 | 3200 |
| 88-A | L. D. Blake | Lost Creek | Huntington | 4324 | 1242 | 25000 | ----- | 1800 |
| 91-A | A. H. Davidson | Lost Creek | Dekalb | 4906 | 1219 | 22200 | 53090 | 1800 |
| 92-A | A. H. Davidson | Lost Creek | Dekalb | 3142 | 902 | 25800 | 32140 | 1600 |
| 98-A | Arthur Sheets | Lost Creek | Elk | 2534 | 706 | 17300 | 25690 | 2000 |

| | | | | | | | | |
|-------------------------|-------------------|---------------|----------------|------|------|-------|-------|------|
| 100-A | Jackson Arnold | Lost Creek | Huntington | 5822 | 1362 | 27400 | 62360 | 3600 |
| 101-A | A. J. Lodge | ----- | ? | 6406 | 1858 | 32200 | 70130 | 2200 |
| 103-A | A. A. Long & Bro. | Bridgeport | Huntington | 5046 | 1553 | 28000 | 48450 | 1200 |
| 104-A | S. S. Farris | Bridgeport | Dekalb | 3046 | 784 | 22600 | 29180 | 2200 |
| 106-A | R. E. L. Stout | Bridgeport | Elk | 3274 | 1376 | 23800 | 29630 | 200 |
| Jackson County | | | | | | | | |
| 48-A | Mr. Bradbury | Sherman | ? | 2330 | 1226 | 32400 | 29020 | 5600 |
| 49-A | W. C. Statts | Sherman | Huntington | 2016 | 864 | 19000 | 54990 | 0 |
| 50-A | W. C. Statts | Sherman | Huntington | 1995 | 1091 | 24200 | 36360 | 0 |
| 51-A | Virgil Bower | Crow Summit | Moshannon | 2152 | 1034 | 21600 | 22640 | 2400 |
| 52-A | Ruben Pickens | Ravenswood | Dekalb | 2042 | 1216 | 26600 | 20280 | 2000 |
| 53-A | F. A. Morgan | Ravenswood | Moshannon | 1670 | 874 | 25000 | 16580 | 2600 |
| 54-A | F. A. Morgan | Ravenswood | Moshannon | 2144 | 973 | 24200 | 23860 | 1400 |
| 55-A | Isaac Starkey | Ravenswood | Holston | 2164 | 739 | 19400 | 22970 | 0 |
| 56-A | M. F. Morgan | Ravenswood | Upshur | 1755 | 546 | 20800 | 21090 | 2600 |
| 57-A | M. F. Morgan | Ravenswood | Holston | 1035 | 354 | 21400 | 16730 | 2800 |
| 83-A | W. A. Proctor | Ravenswood | Wheeling | 3784 | 3636 | 23400 | 45810 | 0 |
| 102-A | Chas. Kalt | Crow Summit | Moshannon | 2430 | 862 | 24800 | 16180 | 1800 |
| Jefferson County | | | | | | | | |
| 5-A | C. D. Wysong | Shepherdstown | Hagerstown | 2336 | 1218 | 51000 | 27150 | 0 |
| Kanawha County | | | | | | | | |
| 43-A | E. C. Crane | Poca | Holston (?) | 3322 | 1529 | 37200 | 31850 | 3200 |
| 107-A | Lewis Milam | Charleston | Dekalb | 2610 | 653 | 25800 | 28780 | 2000 |
| 108-A | W. A. Lawson | Charleston | Dekalb | 2224 | 434 | 16600 | 30580 | 1600 |
| 110-A | Geo. Johnson | Charleston | Holston | 1890 | 715 | 10100 | 18020 | 2000 |
| Marion County | | | | | | | | |
| 81-A | County Poor Farm | Fairmont | Westmoreland | 2746 | 1020 | 35600 | ----- | 2400 |
| 86-A | Mr. Meredith | Fairmont | Huntington (?) | 3846 | 1119 | 27400 | 41380 | 3800 |
| 89-A | J. S. Nuzum | Colfax | Westmoreland | 4076 | 1526 | 34800 | ----- | 2000 |
| 95-A | J. F. Phillips | Fairmont | Elk | 3280 | 997 | 23000 | 36220 | 0 |
| 96-A | L. N. Beatty | Mannington | Moshannon | 3444 | 1226 | 32600 | 30470 | 3800 |
| 99-A | W. F. Boyers | Fairmont | Elk | 2744 | 839 | 23200 | 26950 | 2000 |

TABLE II (Continued).—Pounds per 2,000,000 Lbs. of Surface Soil.

| Sample Number | Owner of Farm | Postoffice | Soil Series | Nitrogen | Phosphorus | Potassium | Carbon | Limestone Requirement |
|--------------------------|------------------|----------------------|-------------|----------|------------|-----------|--------|-----------------------|
| Mason County | | | | | | | | |
| 76-A | J. T. Kincaid | Pt. Pleasant | Holston | 1615 | 649 | 22600 | 15490 | 1600 |
| 78-A | J. McCausland | Pt. Pleasant | Moshannon | 3316 | 712 | 39000 | 31700 | 5200 |
| 80-A | Ira Z. Swisher | Pt. Pleasant | Huntington | 2975 | 1557 | 22600 | 30050 | 2200 |
| 82-A | Jerome Plants | Ambrosia | Upshur | 1760 | 425 | 39000 | 20990 | 3800 |
| Mineral County | | | | | | | | |
| 20-A | Ed. Leatherman | Keyser | ? | 6485 | 776 | 7400 | 175630 | 3800 |
| Monongalia County | | | | | | | | |
| 2-A | Exp. Station | Morgantown | Dekalb | | 698 | 28400 | 22900 | 3000 |
| 16-A | Exp. Station | Morgantown | Dekalb | 2058 | 718 | 26000 | 23140 | 3000 |
| 23-A | Geo. C. Sturgiss | Morgantown | ? | 6821 | 1630 | 30800 | 77210 | 2000 |
| Morgan County | | | | | | | | |
| 10-A | Mr. Henry | Stotlers Cross Roads | Clay Loam | 2272 | 891 | 18000 | 29000 | 2400 |
| 11-A | Mr. Henry | Stotlers Cross Roads | Silt Loam | 3517 | 626 | 19000 | 16690 | 800 |
| 17-A | Somer's Orchard | Cherry Run | ? | 2331 | 798 | 30200 | 38080 | 4000 |
| 19-A | Somer's Orchard | Cherry Run | ? | 2357 | 925 | 29600 | 31400 | 1200 |
| Nicholas County | | | | | | | | |
| 41-A | E. P. Foster | Gauley Bridge | Black Sand | 2135 | | 1200 | 38630 | 5000 |
| Pleasants County | | | | | | | | |
| 6-A | J. B. Kester | Belmont | Wheeling | 3423 | 2248 | 23000 | 38460 | 3000 |
| Preston County | | | | | | | | |
| 66-A | A. M. McMillen | Mason town | Dekalb | 3374 | 697 | 20000 | 47230 | 1400 |
| 67-A | Sanford Watson | Mason town | Dekalb | 4326 | 2159 | 26000 | 47320 | 1600 |
| 68-A | B. T. Gibson | Mason town | Holly | 3984 | 923 | 24600 | 45700 | 1600 |
| 69-A | J. F. Copeman | Kingwood | Dekalb (?) | 4746 | 2146 | 31000 | 49230 | 1400 |

| | | | | | | | | |
|---------------------------|----------------|---------------|--------------|------|-------|-------|-------|------|
| 70-A | County Farm | Kingwood | Dekalb | 3870 | 1203 | 27000 | 41420 | 400 |
| 71-A | T. B. Taylor | Terra Alta | Upshur | 2986 | 761 | 25600 | 37250 | 0 |
| 72-A | J. A. Dodge | Terra Alta | Dekalb | 4142 | 1135 | 23400 | 48680 | 2600 |
| Ritchie County | | | | | | | | |
| 60-A | J. F. Lowther | Pullman | Upshur | 2802 | | 34800 | 26820 | 5000 |
| Roane County | | | | | | | | |
| 97-A | C. C. Hardman | Spencer | Dekalb | 2132 | 482 | 27400 | 22880 | 2200 |
| Taylor County | | | | | | | | |
| 3-A | G. Smith | Flemington | ? | 4268 | 1603 | 32400 | 57590 | 2400 |
| 14-A | F. B. Haller | Rosemont | Westmoreland | 2954 | 1181 | 25000 | 34360 | 3000 |
| 15-A | M. G. Lawson | Flemington | Elk | 3699 | 1213 | 22000 | 40400 | 3400 |
| Wayne County | | | | | | | | |
| 12-A | W. J. Smith | Centerville | Holston | 2299 | 806 | 21200 | 26170 | 1200 |
| 13-A | W. F. Plymale | Centerville | Holston | 3355 | 1148 | 33600 | 34280 | 3400 |
| Wood County | | | | | | | | |
| 7-A | Mr. Creel | Davisville | Tyler | 2686 | 1163 | 25200 | 27450 | 3400 |
| 8-A | J. A. Creel | Davisville | Upshur | 2551 | 950 | 37600 | 25900 | 5200 |
| 9-A | J. A. Creel | Davisville | Dekalb | 1669 | 680 | 26200 | 17601 | 1200 |
| 59-A | J. F. Doan | Parkersburg | Upshur | 2077 | | 36400 | 18350 | 6400 |
| 62-A | J. W. Miller | Mineral Wells | Huntington | 1550 | 782 | 18400 | 14150 | 800 |
| 63-A | E. J. Humphrey | Belleville | Huntington | 2724 | 1457 | 14200 | 33680 | 800 |
| 64-A | A. F. Bonar | Belleville | Brooke | 3004 | 1543 | 40200 | 30120 | 0 |
| 73-A | H. G. Butcher | Mineral Wells | Huntington | 1970 | 918 | 34200 | 16490 | 2400 |
| 77-A | Mr. Barnett | Davisville | Tyler | 3910 | 1108 | 34800 | 41380 | 5200 |
| 93-A | S. F. Romine | Washington | Dekalb | 1904 | 586 | 22200 | 21790 | 1000 |
| 94-A | Dr. Keefer | Belleville | Wheeling | 3496 | 1563 | 26200 | 31480 | 1400 |
| Wayne County, Ohio | | | | | | | | |
| 115-A | Ohio Exp. Sta. | Wooster, Ohio | Volusia | 1775 | 604 | 28600 | | 3200 |

TABLE III.—Pounds per 2,000,000 Lbs. of Surface Soil.

| Sample Number | Owner of Farm | Postoffice | County | Nitrogen | Phosphorus | Potassium | Carbon | Limestone Requirement ^t |
|----------------------|-----------------|----------------------|------------|----------|------------|-----------|--------|------------------------------------|
| Brooke Series | | | | | | | | |
| 42-A | Robt. Patterson | Wellsburg | Brooke | 3646 | 1365 | 48000 | 53010 | 0 |
| 64-A | A. F. Bonar | Belleville | Wood | 3004 | 1543 | 40200 | 30120 | 0 |
| 114-A? | Wm. Brady | Collier | Brooke | 3060 | 1125 | 31200 | 30970 | 2800 |
| Dekalb Series | | | | | | | | |
| 2-A | Exp. Station | Morgantown | Monongalia | | 698 | 28400 | 22900 | 3000 |
| 9-A | J. A. Creel | Davisville | Wood | 1669 | 680 | 26200 | 17601 | 1200 |
| 10-A | Mr. Henry | Stotlers Cross Roads | Morgan | 2272 | 891 | 18000 | 29000 | 2400 |
| 16-A | Exp. Station | Morgantown | Monongalia | 2058 | 718 | 26000 | 23140 | 3000 |
| 39-A | B. A. Fleshman | Fayetteville | Fayette | 1210 | 421 | 11000 | 25370 | 2200 |
| 52-A | Ruben Pickens | Ravenswood | Jackson | 2042 | 1216 | 26600 | 20280 | 2000 |
| 58-A | L. V. Shawver | Corliss | Fayette | 3124 | 753 | 18400 | 48280 | 4600 |
| 61-A | T. C. Jones | Oak Hill | Fayette | 2082 | 483 | 16000 | 30550 | 2400 |
| 65-A | L. P. Willis | Mountain Cove | Fayette | 2602 | 662 | 11200 | 32450 | 2200 |
| 66-A | A. F. McMillen | Masontown | Preston | 3374 | 697 | 20000 | 47230 | 1400 |
| 67-A? | Sanford Watson | Masontown | Preston | 4326 | 2159 | 26000 | 47320 | 1600 |
| 69-A? | J. F. Copeman | Kingwood | Preston | 4746 | 2146 | 31000 | 49230 | 1400 |
| 70-A | County Farm | Kingwood | Preston | 3870 | 1203 | 27000 | 41420 | 400 |
| 72-A | J. A. Dodge | Terra Alta | Preston | 4142 | 1135 | 23400 | 48680 | 2600 |
| 74-A | Perry Lawson | Milton | Cabell | 1520 | 370 | 17200 | 21210 | 1000 |
| 87-A | Arthur Sheets | Lost Creek | Harrison | 2750 | 706 | 22000 | 32140 | 3200 |
| 90-A | W. D. Zinn | Philippi | Barbour | 4185 | 1236 | 27400 | 43910 | 3200 |
| 91-A | A. H. Davidson | Lost Creek | Harrison | 4906 | 1219 | 22200 | 53090 | 1800 |
| 92-A | A. H. Davidson | Lost Creek | Harrison | 3142 | 902 | 25800 | 32140 | 1600 |
| 93-A | S. F. Romine | Washington | Wood | 1904 | 586 | 22200 | 21790 | 1000 |
| 97-A | C. C. Hardman | Spencer | Roane | 2132 | 482 | 23800 | 22880 | 2200 |
| 104-A | S. S. Farris | Bridgeport | Harrison | 3046 | 784 | 22600 | 29180 | 2200 |
| 107-A | Lewis Milam | Charleston | Kanawha | 2610 | 653 | 25800 | 28780 | 2000 |

| | | | | | | | | |
|--------------------------|--------------------|---------------|------------|------|------|--------|-------|------|
| 108-A | W. A. Lawson | Charleston | Kanawha | 2224 | 434 | 16600 | 30580 | 1600 |
| 109-A | J. B. Kessler | Clifty | Fayette | 3384 | 660 | 20200 | 39490 | 2800 |
| Elk Series | | | | | | | | |
| 15-A | M. G. Lawson | Flemington | Taylor | 3699 | 1213 | 22000 | 40400 | 3400 |
| 95-A | J. F. Phillips | Fairmont | Marion | 3280 | 997 | 23000 | 36220 | 0 |
| 98-A | Arthur Sheets | Lost Creek | Harrison | 2534 | 706 | 17800 | 25690 | 2000 |
| 99-A | W. F. Boyers | Fairmont | Marion | 2744 | 839 | 23200 | 26950 | 2000 |
| 106-A | R. E. L. Stout | Bridgeport | Harrison | 3274 | 1376 | 23800 | 29630 | 200 |
| Hagerstown Series | | | | | | | | |
| 5-A | C. D. Wyson | Shepherdstown | Jefferson | 2336 | 1218 | 51000 | 27150 | 0 |
| 24-A? | John Miller | Martinsburg | Berkeley | 2358 | 1631 | 40600 | 19620 | 1000 |
| 26-A? | Back Creek Or. Co. | Hedgesville | Berkeley | 1442 | 536 | 23800 | 22010 | 2400 |
| 28-A | John Miller | Martinsburg | Berkeley | 2081 | 2020 | 53800 | 15480 | 800 |
| 29-A | Mrs. Lupton | Martinsburg | Berkeley | 2235 | 1086 | 49000 | 23030 | 0 |
| 32-A | J. W. Stewart | Tabler | Berkeley | 2152 | 1282 | 49600 | 21660 | 0 |
| 33-A? | D. Gold Miller | Martinsburg | Berkeley | 2296 | 917 | 108800 | 23950 | 1000 |
| 34-A? | Dr. Shipper | Gerrardstown | Berkeley | 2558 | 1322 | 31200 | 26110 | 3000 |
| 37-A? | Gr. Golden Or. Co. | Martinsburg | Berkeley | 2486 | 1327 | 55000 | 27290 | 2200 |
| 38-A? | Senator Silver | Gerrardstown | Berkeley | 3083 | 1117 | 52600 | 30480 | 0 |
| 47-A | Rev. H. A. Murrill | Lewisburg | Greenbrier | 2884 | 1289 | 27400 | 26560 | 1200 |
| Holston Series | | | | | | | | |
| 12-A | W. J. Smith | Centerville | Wayne | 2299 | 806 | 21200 | 26170 | 1200 |
| 13-A | W. F. Plymale | Centerville | Wayne | 3385 | 1148 | 33600 | 34280 | 3400 |
| 21-A | Mr. Sios | Ona | Cabell | 1537 | 830 | 17600 | 15210 | 1400 |
| 22-A? | C. R. Morris | Martha | Cabell | 2893 | 2066 | 56600 | 31760 | 1800 |
| 43-A? | E. C. Crane | Poca | Kanawha | 3322 | 1529 | 37200 | 31850 | 3200 |
| 55-A | Isaac Starkey | Ravenswood | Jackson | 2164 | 739 | 19400 | 22970 | 0 |
| 57-A | M. F. Morgan | Ravenswood | Jackson | 1035 | 354 | 21400 | 16730 | 2800 |
| 75-A | J. H. Moore | Milton | Cabell | 4344 | 1187 | 35400 | 62970 | 0 |
| 76-A | J. T. Kincaid | Pt. Pleasant | Mason | 1615 | 649 | 22600 | 15490 | 1600 |
| 84-A | John White | Culloden | Cabell | 1764 | 566 | 14400 | 20230 | 2200 |

TABLE III (Continued).—Pounds per 2,000,000 Lbs. of Surface Soil.

| Sample Number | Owner of Farm | Postoffice | County | Nitrogen | Phosphorus | Potassium | Carbon | Limestone Requirement |
|--------------------------------|-------------------|---------------|-----------|----------|------------|-----------|--------|-----------------------|
| Holston Series (Cont'd) | | | | | | | | |
| 110-A | Geo. Johnson | Charleston | Kanawha | 1890 | 715 | 10100 | 18020 | 2000 |
| 113-A | J. E. Coleman | West Union | Doddridge | 3240 | 806 | 27800 | 34770 | 1800 |
| Holly Series | | | | | | | | |
| 68-A | B. T. Gibson | Masontown | Preston | 3984 | 923 | 24600 | 45700 | 1600 |
| Huntington Series | | | | | | | | |
| 40-A | Robt. Underwood | Wellsburg | Brooke | 5912 | 2648 | 38000 | 67010 | 3000 |
| 49-A | W. C. Statts | Sherman | Jackson | 2016 | 864 | 19000 | 54990 | 0 |
| 50-A | W. C. Statts | Sherman | Jackson | 1995 | 1091 | 24200 | 36360 | 0 |
| 62-A | J. W. Miller | Mineral Wells | Wood | 1550 | 782 | 18400 | 14150 | 800 |
| 63-A | E. J. Humphrey | Belleville | Wood | 2724 | 1457 | 14200 | 33680 | 800 |
| 73-A | H. G. Butcher | Mineral Wells | Wood | 1970 | 918 | 34200 | 16490 | 2400 |
| 80-A | Ira Z. Swisher | Pt. Pleasant | Mason | 2975 | 1557 | 22600 | 30050 | 2200 |
| 86-A | Mr. Meredith | Fairmont | Marion | 3846 | 1119 | 27400 | 41380 | 3800 |
| 88-A | L. D. Blake | Lost Creek | Harrison | 4324 | 1242 | 25000 | ----- | 1800 |
| 100-A | Jackson Arnold | Lost Creek | Harrison | 5822 | 1362 | 27400 | 62360 | 3600 |
| 103-A | A. A. Long & Bro. | Bridgeport | Harrison | 5046 | 1553 | 28000 | 48450 | 1200 |
| Meigs Series | | | | | | | | |
| 4-A | Mr. Wilson | Ona | Cabell | 1375 | 588 | ----- | 19170 | 4400 |
| Moshannon Series | | | | | | | | |
| 51-A | Virgil Bower | Crow Summit | Jackson | 2152 | 1034 | 21600 | 22640 | 2400 |
| 53-A | F. A. Morgan | Ravenswood | Jackson | 1670 | 874 | 25000 | 16580 | 2600 |
| 54-A | F. A. Morgan | Ravenswood | Jackson | 2144 | 973 | 24200 | 23860 | 1400 |
| 78-A | J. McCausland | Pt. Pleasant | Mason | 3316 | 712 | 39000 | 31700 | 5200 |

96-A L. N. Beatty
102-A Chas. Kalt

Mannington
Crow Summit

Marion
Jackson

3444
2439

32600
24800

30470
16180

3800
1800

Tyler Series

7-A Mr. Creel
77-A Mr. Barnett
85-A? W. D. Zinn

Davisville
Davisville
Philippi

2680
3910
3214

25200
34800
18600

27450
41380
35510

3400
5200
1800

Upshur Series

8-A J. A. Creel
18-A Mr. Clark
56-A M. F. Morgan
59-A J. F. Dean
60-A J. F. Lowther
71-A T. B. Taylor
82-A Jerome Plants
112-A W. D. Zinn

Davisville
Ona
Ravenswood
Parkersburg
Pullman
Terra Alta
Ambrosia
Philippi

2551
2482
1755
2077
2802
2986
1760
4102

37600
49800
20800
36400
34800
25600
39000
49600

25900
21620
21090
18350
26820
37250
20990
32210

5200
0
2600
6400
5000
0
3800
1600

Westmoreland Series

1-A Fred Whitman
14-A? F. B. Haller
81-A Poor Farm
89-A J. S. Nuzum

Adamston
Rosemont
Fairmont
Colfax

2930
2954
2746
4076

42400
25000
35600
34800

31330
34360

2800
3000
2400
2000

Wheeling Series

6-A J. B. Kester
79-A Ed. Kyle
83-A W. A. Procter
94-A Dr. Keefer
111-A -----

Belmont
Coxs Landing
Ravenswood
Belleville
Follansbee

3423
1824
3784
3496
1940

23000
25600
23500
26200
21600

38460
17810
45810
31480

3000
2000
0
1400
3600

HISTORY OF SOIL SAMPLES.

1-A—Discard*, 10.70%. Hillside north of barn; cleared 40 to 50 years; soil, light gray; subsoil, yellowish; rolling highland; drainage, natural; bluegrass predominates in pasture; no manure applied, no fertilizer, no lime, no legumes grown; red clover does fairly well; sorrel is principal weed; soil varied more or less on side of hill and resulting sample was a composite representing several phases of this type of soil.

2-A.—No discard. (Plot 18) Soil, yellowish; level; taken from plot which has received no fertilizer or lime treatment for some time.

3-A.—Discard, 2.13%. Hickory, poplar, and sycamore originally grew on land; cleared approximately 75 years; soil, chocolate; subsoil, light brown; level overflow; drainage, natural; meadow since clearing, 2 tons per acre; timothy and orchard grass predominate; fed over in winter; no manure applied, no fertilizer, no lime; red clover with the grass; red clover apparently does well; yarrow, broad and narrow plantain, the principal weeds; limestone outcrops on hillside around flat.

4-A.—Discard, 7.15%. Top of hill back of barn; cleared one year; soil, light gray; subsoil, yellowish; rolling highland; drainage, natural; corn, 50 bushels per acre; no manure applied, no fertilizer, no lime; no legumes grown; do not know whether red clover does well or not; some sorrel. This represents new soil.

5-A.—Discard 3.17%. Between house and highway; white oak, hickory, walnut, and locust originally grew on land; cleared 100 years; soil, chocolate; subsoil, dark red; rolling highland; drainage, natural; corn each summer; rye each winter until this year (pasture); 38 bushels of corn per acre; 7 tons manure per acre each 3 years; 150 pounds of acid phosphate each year; 1 ton burned lime 12 years ago; hog weed, morning glory, Jamestown weed, the principal weeds; the field contains only about $1\frac{1}{4}$ acres but the rotation of corn and rye each year for thirty years makes it interesting. Field is just outside the corporation limits of Shepherdstown.

*The discard represents the particles of shale and rock which would not pass a 2-mm. sieve. This part was separated from the sample before analysis was made.

6-A.—Discard, 2.27%. Northeast of dwelling; beech, hickory, and sugar originally grew on land; cleared 75 years; soil, chocolate; subsoil, chocolate to yellow; level terrace; drainage, natural; meadow 9/10 of time; 2 tons of hay per acre; timothy and red top predominate; 12 tons manure applied once in 4 years; 300 pounds mixed goods applied 4 years ago; no lime; no legumes grown; very few red clover plants present; sedge, cinquefoil, and blue devil, the principal weeds; about fifteen acres level land in field about 100 yards northeast of railroad depot.

7-A.—Discard, 3.72%. Along road west of cross roads; cleared 75 years; soil, light gray; subsoil, darker; level terrace; drainage, natural; corn, oats, wheat, and hay; some manure applied; red clover does not do very well; sorrel, the principal weed.

8-A.—Discard, 2.36%. Orchard back of barn; cleared 35 years; soil, red; subsoil, red; rolling highland; drainage, natural; clover has been grown; red clover does fairly well; sorrel, the principal weed.

9-A.—Discard, 2.38%. North of barn; cleared 50 years; soil, light yellow; subsoil, darker yellow; rolling highland; level area in rolling field; drainage, natural; rotation of oats, wheat and clover; manure applied every 3 or 4 years; some fertilizer applied for wheat; red clover grown; does fairly well.

10-A.—Discard, 8.41%. Across road from barn; cleared 20 years; soil, light yellow; subsoil, yellowish; level highland terrace; drainage, natural; rotation of corn, wheat, clover and timothy; manure applied occasionally; some fertilizer; some hydrated lime; red clover grown; red clover does fairly well; considerable sorrel.

11-A.—Discard, .78%. Near bridge southeast of farm; cleared 20 to 30 years; soil, reddish; subsoil, reddish; level terrace; drainage, natural; rotation of tomatoes, wheat and clover; mixed fertilizer applied; some lime; red clover grown; red clover does fairly well.

12-A.—Discard, .94%. Terrace back of orchard; cleared 50 years; soil, light gray; rolling terrace; drainage, natural; corn and hay grown; some clover grown; sorrel and poverty grass, the principal weeds.

13-A.—Discard, 15.8%. Across road from schoolhouse; cleared 50 years; soil, light gray; level terrace; drainage, nat-

ural and some artificial; land mostly in meadow, now in cowpeas; some fertilizer applied; cowpeas grown; corresponding land not tile drained shows very poor meadows full of sorrel, broomsedge, etc.

14-A.—Discard, 4.44%. Center of farm; oak, cherry and some poplar originally grew on land; cleared 100 to 125 years; rolling highland; drainage, natural; rotation 3 years; corn, oats, clover and potatoes; yield, oats 25 bushels, corn 60 bushels, clover 2 tons, potatoes 200 bushels; some manure applied each three years; 200 pounds acid phosphate on all except potatoes; 1600 pounds home mixed; no lime; clover grown; red clover does fairly well; joint grass and foxtail, the principal weeds.

15-A.—Discard, 3.65%. South of house along road; oak originally grew on land; cleared over 100 years; soil, light brown; subsoil, dark yellow mottled; nearly level terrace; drainage, natural; meadow, one crop of corn 15 years ago; about one ton per acre; timothy predominates; no red clover sown; moss, sedge, running briars, cinquefoil, and yarrow, the principal weeds.

16-A.—Discard, 1.55%. Experiment Station plots; soil, light yellow; level highland; drainage, natural and artificial; variety of crops grown; plot 21; no manure applied; no fertilizer; no lime; red clover does not do well; sorrel and yellow trefoil, the principal weeds.

17-A.—Discard, 20.39%. Pine knob; cleared 5 years; soil, light brown; subsoil, yellowish brown; rolling highland; drainage, natural; orchard; crimson clover grown; sorrel, the principal weed; land cleared and farmed years ago but allowed to run wild again.

18-A.—Discard, 2.05%. Orchard on hill back of house; cleared 25 to 30 years; soil, red; subsoil, red; drainage, natural, not very good; orchard sown in clover; no manure applied; no lime; red clover grown; red clover does well.

19-A.—Discard, 26.41%. Oak land; cleared 5 years; soil, dark gray; subsoil, light gray; rolling highland; orchard; crimson clover grown; sorrel, the principal weed; cleared from forest years before but covered with second growth and this cleared off about 5 years; drainage, natural.

20-A.—Discard, 80.34%. Recently cleared orchard land.

21-A.—Discard, 2.57%. Northeast of barn, second field; cleared many years; soil, light gray; subsoil, yellowish; roll-

ing highland or second terrace; drainage, natural; rotation of corn, wheat, hay and tobacco; very little manure applied; very little fertilizer; no lime; red clover very poor; sorrel, the principal weed; very poor growth of grass.

22-A.—Discard, .84%. South of Elmwood church; cleared 50 years; soil, grayish; subsoil, grayish; level terrace; drainage, natural; rotation of corn, wheat, clover and tobacco; some manure applied; red clover grown; red clover does fairly well.

23-A.—Discard, 1.40%. Cleared many years; no rotation practiced; yield of crops not known; last potatoes no good; do not know what grasses predominate; no fertilizer applied; no lime; some white clover grown; red clover does not do well; milkweed, the principal weed.

24-A.—Discard, 41.74%. Cleared over 50 years; Apple Pie Ridge; soil, yellow; subsoil, yellow; rolling highland; drainage natural; nothing but orchard; 3-year average, 79 barrels apples; 400 pounds yearly of 4-10-8 fertilizer; no lime; no legumes; red clover would do well if given a chance; cheat grass, the principal weed; a very profitable orchard.

25-A.—Discard, 32.28%. On top of ridge; cleared over 50 years; rolling highland; drainage, natural; nothing but orchard cultivation; 3-year average, 79 barrels apples per acre; 400 pounds yearly of 4-10-8 fertilizer; no legumes grown; never tried red clover; cheat grass the principal weed; a good yielder of apples.

26-A.—Discard, 33.33%. Center of farm; cleared over 50 years; soil, red; subsoil, red; rolling highland; drainage, natural; cover crops in fall; peaches good, apples only fair, about 40 barrels per acre; 4-10-7 fertilizer and lime applied occasionally; crimson clover and cowpeas grown; never tried red clover; good soil for peaches if nitrogen is added; a little light for apples.

27-A.—Discard, 46.78%. Cleared only 10 years; soil, yellow; subsoil, yellow; level; drainage, natural; cowpeas and soybeans grown; orchard: not bearing; 400 pounds 4-8-7 fertilizer applied now and then; yellow shale soil, naturally poor; trees show neglect soon; manures and clovers help considerably.

28-A.—Discard, 21.98%. Soil, brown; subsoil, brown; Apple Pie Ridge; rolling highland; drainage, natural; 3-year average, 79 barrels per acre; 400 pounds 4-8-7 fertilizer

yearly; cover crops 10 year ago; cheat grass, the principal weed; heavy growth of cheat grass plowed under each year.

29-A.—Discard, 11.06%. Cleared 75 years; soil, yellowish brown; subsoil, yellow to brown; rolling highland; drainage, natural; corn grown only when orchard is young; orchard not bearing; 300 pounds 4-10-8 fertilizer applied occasionally; some clover grown; orchard about 10 years; not taking inter-crops off any more; good soil; outcrops of limestone.

30-A.—Discard, 52.30%. Cleared 50 years; soil, yellow; subsoil, yellow; rolling highland; drainage, natural; rotation of corn, oats and wheat; low yield; very little manure applied; 200 pounds 0-8-3 fertilizer applied occasionally; ground poor, trees doing poorly.

31-A.—Discard, 20.31%. Soil, yellow; subsoil, yellow; level overflow; drainage, natural; good apple yield, 60 barrels per acre; light applications of manure; just out of soapstone area; raising good crops.

32-A.—Discard, 17.39%. Cleared 50 years; soil, brown to black; subsoil, brown; level; no rotation practiced; 68 barrels apples per acre; 400 pounds 2-10-8 fertilizer yearly; crimson clover grown; red clover does well; good soil; high-producing orchards; clovers always plowed under.

33-A.—Discard, 40.23%. Cleared 50 years; soil, yellowish brown; subsoil, yellow; drainage, natural; good yield; manure occasionally applied about weak trees; 300 to 400 pounds 4-10-8 fertilizer when cropped; crimson clover grown; red clover does well; a good orchard on Apple Pie Ridge, well taken care of.

34-A.—Discard, 59.04%. Pine originally grew on land; cleared 40 years or more; soil, blue to gray; subsoil, bluish gray; (black slate); drainage, natural; yield low, about 30 barrels apples; occasionally 200 pounds 4-8-10 fertilizer applied; red clover does well; poor soil; manures and clovers help wonderfully.

35-A.—Discard, 16.08%. Pine originally grew on land; cleared 30 years or more; soil, yellow to bluish; subsoil, yellow and black slate; rolling terrace; drainage, natural; yield not very high; fertilizer applied occasionally; crimson clover grown; red clover does well.

36-A.—Discard, 41.12%. Cleared 40 years or more; soil, yellow to brown; subsoil, yellow; Apple Pie Ridge; rolling highland; yield high, 70 barrels; manure occasionally about trees; 4-10-8 fertilizer when crop is present; crimson clover grown; red clover does well; good soil; a good orchard well taken care of.

37-A.—Discard, 7.07%. Cleared 40 years; soil, yellowish brown; subsoil, yellow; level; drainage, natural; clean cultivation now; not bearing; manure and 4-10-8 fertilizer occasionally applied; some crimson clover grown; red clover does well.

38-A.—Discard, 11.19%. Cleared 40 years at least; soil, brown; subsoil, brown to yellow; rolling terrace; drainage, natural; yield good, 70 barrels average; manure applied occasionally; 500 pounds 4-10-8 fertilizer applied yearly; burned lime applied 1-10 years; crimson clover grown; red clover does well; good orchard; good management; cheat grass; outcrop of limestone.

39-A.—Discard, 1.32%. South of house; oak land; cleared 80 years; soil, chocolate; subsoil, yellowish; rolling highland; drainage, natural; yield rather low but getting better; no manure applied; fertilized heavily last few years; no lime; red clover grown; sorrel, the principal weed; probably in tobacco for years but for last 20 years corn, buckwheat, timothy and clover.

40-A.—Sugar and black walnut originally grew on land; cleared 65 to 70 years; soil, black; subsoil, gray; level, first bottom; drainage, natural; rotation of corn, oats, clover and timothy; no manure applied; no fertilizer; no lime; clover grown; red clover does well; present ownership 18 years; previous to this land had been poorly farmed.

41-A.—Discard. A typical black sand.

42-A.—West of road; cleared a great many years; soil, dark red; subsoil, red; rolling highland; rotation of corn, wheat and hay; little manure applied; no fertilizer; no lime; clover grown; soil covered with fragments of limestone; at present land is in alfalfa.

43-A.—Southwest of barn; oak, sugar, beech and poplar originally grew on land; cleared 75 or 80 years; soil, chocolate; level terrace; needs drainage; rotation of corn, wheat and timothy; 40 or 50 bushels corn; several applications of ma-

nure; no fertilizer; no lime; once in cowpeas, once in beans; clover formerly did well, though not now; pea vines, the principal weeds.

44-A.—South of house; oak and maple originally grew on land; cleared 40 to 50 years; soil, dark gray; subsoil, mottled; level bottom swamp; mostly grass, corn years ago; no manure applied; no fertilizer; no lime; typical "Meadows" from Little Clear Creek.

45-A.—Practically same as 44-A from wet undrained bottom meadow land.

46-A.—West of barn; oak and chestnut originally grew on land; cleared 75 years; soil, chocolate; subsoil, dark brown; level highland; rotation of corn, oats, wheat and hay; manure applied occasionally; acid phosphate 10-12 years; no lime; red clover grown; typical soapstone land.

47-A.—South of barn; oak, poplar and walnut originally grew on land; cleared 75 years; soil, dark gray; subsoil, light gray; mostly pasture for some time; some manure applied; no fertilizer; no lime; red clover grown. This should be typical limestone soil.

48-A.—Lower end of Buffington Island. This sample was taken from side of exposed strata along river shore where river had cut away into the bank.

49-A.—Cottonwood and sycamore originally grew on land; cleared 75 years or more; soil, black; subsoil, dark brown; level overflow; drainage, natural; all corn, occasionally watermelons; 60 to 65 bushels per acre; no manure applied; no fertilizer; no lime; no legumes grown; red clover does well; smartweed and pigweed, the principal weeds; very good corn land; potatoes do not do particularly well. This soil is from lower bottom, overflowing every year.

50-A.—Cottonwood and sycamore originally grew on land; cleared 75 years or more; soil, dark brown; subsoil, dark brown; level overflow; drainage, natural; all corn; 60 to 65 bushels per acre; no manure applied; no fertilizer; no lime; no legumes grown; red clover does well; smartweed and horseweed, the principal weeds; very good corn land; potatoes do not do very well; soil from upper bottom, overflowing every few years.

51-A.—Oak, pine and hickory originally grew on land; cleared 50 years; soil, reddish; subsoil, red; level terrace;

drainage, natural; rotation of corn, wheat, clover and timothy; 50 bushels corn, 12 bushels wheat; no manure applied; no fertilizer; no lime; clover grown; red clover does well; foxtail, ragweed, etc., the principal weeds; common type of small stream bottom soil in West Virginia, with Upshur highlands surrounding it.

52-A.—Oak, pine and hickory originally grew on land; cleared 5 years; soil, dark gray; subsoil, yellowish; steep highland; drainage, natural; pasture land; never in crops; bluegrass predominates; no manure applied; no fertilizer; no lime; no legumes grown; do not know if red clover does well; ragweed, sumac bushes, the principal growth; as near "virgin" soil as any in locality; example of soil which is cleared and no crops have since been removed; has been pastured very lightly.

53-A.—Creek bottom; oak, cottonwood and sycamore originally grew on land; cleared 50 years; soil, reddish brown; subsoil, red; level overflow and terrace; drainage, natural; corn and grass; no system until recently; 35 bushels corn; 2 tons hay; no manure applied; no fertilizer; no lime; clover grown; red clover does well; crab grass, ragweed and morning glory, the principal weeds.

54-A.—South side creek bottom; sycamore, cottonwood and oak originally grew on land; cleared 50 years; soil, reddish brown; subsoil, red; level overflow and terrace; drainage, natural; corn and grass; no system until recently; 35 bushels corn, 2 tons hay; no manure applied; no fertilizer; no lime; red clover grown; red clover does well; ragweed, crab grass and morning glory, the principal weeds.

55-A.—Center of farm; oak, hickory, tulip and pine originally grew on land; cleared 100 years; soil, light gray; subsoil, yellow; level terrace; drainage, natural; rotation of corn, timothy and cowpeas; 50 bushels corn; Japan clover, broomsedge and foxtail predominate; manure applied three times in last 6 years, thin 8 tons; 14% acid phosphate, 350 per acre; no lime; to be applied soon; cowpeas, crimson clover and red clover grown; red clover does not do well; foxtail, ragweed, sorrel and broomsedge, the principal weeds. This soil was very much depleted during slavery times; is oldest farm in country; was very much run down until about eight years ago; present owner has applied much fertilizer, at first bone meal, now acid phosphate.

56-A.—Oak, hickory, locust and tulip originally grew on land; cleared 75 years ago but has been in pasture and thicket

for 30 years; soil, gray; subsoil, reddish yellow; rolling highland; drainage, natural; pasture land; wild grasses, Canadian bluegrass and some Kentucky bluegrass; no manure applied; no fertilizer; no lime; do not know if red clover does well; sorrel, broomsedge and blackberries, principal growth; is to be cleared for peach orchard this year; was in locust and persimmon thicket until 2 years ago.

57-A.—Oak, hickory, poplar and ash originally grew on land; cleared 25 years; soil, light gray; subsoil, yellow; level terrace; drainage, natural; rotation of corn, wheat, clover and timothy; 35 bushels corn, 12 bushels wheat, 1 ton hay; poverty grass, foxtail and red top predominate; manure applied occasionally in spots; 16% acid phosphate, 400 pounds per acre every 4 years, and 2-8-2 before 1906; no lime; clover grown; red clover does only fairly well; foxtail and ragweed, the principal weeds.

58-A.—Oak and poplar originally grew on land; cleared 10 to 15 years; soil, grayish; subsoil, yellow; rolling highland; drainage, natural; sod; no manure applied; no fertilizer; no lime, no legumes; red clover does well; cinquefoil, the principal weed.

59-A.—Southeast of barn; white oak originally grew on land; cleared 50 years; soil, dark red; subsoil, dark red; rolling highland; poor drainage, too tenaceous; farmed perhaps earlier but last 30 years allowed to run to grass and underbrush; grubs, sorrel, etc., predominate; little manure applied; little fertilizer; no lime; red clover does well; wild sweet potatoes; briers and milkweed, the principal weeds.

60-A.—White oak originally grew on land; cleared 50 to 60 years; soil, red; subsoil, red; rolling highland; pasture, corn and wheat; 15 bushels wheat, 60 bushels corn; no manure applied; fertilizer applied once; no lime; no legumes grown; red clover does well; some sorrel.

61-A.—Discard, 2.21%. Oak and poplar originally grew on land; cleared 100 years; soil, yellowish; subsoil, light yellow; rolling highland; drainage, natural; poverty grass, etc., predominate; no manure applied; no fertilizer; no lime; legumes grown very little. This soil was in tobacco for years, but of late years has been practically abandoned and let go to briers, etc.

62-A.—South of barn; sugar trees originally grew on land; cleared 75 years; soil, reddish; subsoil, reddish; level

overflow; drainage, artificial; rotation of corn and wheat for 50 years; 60 to 70 bushels of corn; no manure applied; no fertilizer; no lime; very little clover; red clover does well; excellent land; overflows once a year.

63-A.—South of locks; cleared 100 years; soil, dark gray; subsoil, grayish; level overflow; drainage, natural; corn and wheat for years; 60 to 100 bushels corn, 20 to 30 bushels wheat; manure applied once or twice; no fertilizer; a little lime; clover grown; red clover does well. This land was overflowed in 1913 and covered with sand, etc.

64-A.—Discard, 23.12%. White oak originally grew on land; cleared 35 years; soil, dark brown; subsoil, reddish; rolling highland; corn and wheat, mostly wheat; 12 to 15 bushels; bluegrass predominates; no manure applied; no fertilizer; no lime; cowpeas a few years; red clover does well. The limestone outcrop was in form of good sized slabs mixed with the soil.

65-A.—Discard, 2.12%. North of barn; oak and poplar originally grew on land; cleared 75 years; soil, grayish; subsoil, yellowish; rolling highland; drainage, natural; corn, oats and hay, also wheat; manure applied every few years; a little complete fertilizer applied; no lime; red clover sown; sapling clover does well; yarrow, cinquefoil, sorrel and some poverty grass, the principal weeds.

66-A.—Discard, 5.49%. One mile north of Masontown, 100 yards east of pike; oak, maple and chestnut originally grew on land; cleared 20 years; soil, light brown; subsoil, light yellow; rolling highland; drainage, natural; corn, wheat, grass; pasture mostly; 60 bushels corn, 1½ tons hay; now in potatoes; 3 cattle supported to the acre; manure applied twice, 4 tons per acre; acid phosphate, 16%, 500 pounds per acre; 2 tons lime per acre; clover grown; red clover does well; cinquefoil and briars, the principal weeds; now in fine cultivation; promises 150 bushels potatoes per acre; rather loose and friable; one of the typical potato soils.

67-A.—Discard, 5.79%. 150 yards northeast of barn; oak, walnut, and locust originally grew on land; cleared 50 years; soil, brown; subsoil, light yellow; rolling highland; drainage, natural; corn, oats, grass (mowed 3 times); pasture before; 50 bushels corn, 40 bushels oats; bluegrass and redtop predominate; 3 acres per steer; manure applied 3 times, 8 tons to the acre; 200 pounds 16% acid phosphate to the acre; limed

10 years ago, 125 bushels; good clover; red clover does well; yarrow and cinquefoil, the principal weeds; north end of hill typifies best pasture land in district.

68-A.—Discard, 2.16%. One-half mile west of house; water oak, ash, and hickory originally grew on land; cleared 40 years; soil, black to gray; subsoil, bluish gray; level overflow; no drainage; pasture; bluegrass, swamp; no manure applied, no fertilizer, no lime; iron weed, mint, alders, and some sorrel, the principal growths.

69-A.—Discard, 20.00%. Southeast of house; white oak originally grew on land; cleared 50 years; soil, dark brown; subsoil, light yellow; rolling highland; drainage, natural; rotation of corn, oats, wheat, and grass; 50 bushels corn; manure applied once in five years; acid phosphate and bone applied; lime applied two or three times, not for 8 or 9 years; some clover grown; red clover does well.

70-A.—Discard, 6.85%. Southeast of barn; oak, chestnut, poplar, and sugar originally grew on land; cleared 75 years; soil, light brown; subsoil, yellowish; rolling highland; rotation of corn, oats, buckwheat, and potatoes; 50 bushels corn; no manure applied for 5 years; some fair grade fertilizer and acid phosphate applied; limed every time plowed for 5 years; mostly timothy grown; red clover does fairly well; no sorrel, buck plantain.

71-A.—Discard, 15.00%. Southeast of barn; poplar and oak originally grew on land; cleared 75 years; soil, brownish red; subsoil, brick red; rolling highland; drainage, natural; rotation of corn, oats, timothy, and clover; 50 bushels corn; manured 3 times in 12 years; acid phosphate applied about 6 times in 12 years; limed 12 years ago, before that had several heavy applications; clover grown; red clover does well; rattle weed and deer tongue, the principal weeds. This farm has been farmed for 75 years and had been worn to the point 25 years ago where it was very unproductive.

72-A.—Discard, 3.11%. Northwest of barn; sugar maple and oak originally grew on land; part cleared 25 years, remainder 50 years; soil, dark brown; subsoil, yellowish; rolling highland; drainage, natural; potatoes, oats, and buckwheat grown; 150 bushels potatoes, 30 bushels buckwheat; several applications of manure; acid phosphate applied; several applications of lime; red clover grown; red clover does well. This is a typical potato and buckwheat soil.

73-A.—Discard, .51%. Bottom south of house; sugar trees originally grew on land; cleared 50 years; soil, red; subsoil, reddish; level overflow; no drainage; corn principally, some meadow; good corn land; no manure applied, no fertilizer, no lime; white clover grown; red clover does well.

74-A.—Discard, 1.80%. Northeast of barn; cleared 50 years; soil, grayish; subsoil, yellowish; rotation of corn, wheat, and timothy; a little manure applied, no fertilizer, no lime; some clover grown; red clover does not do very well.

75-A.—Discard, 3.93%. West of house; beech and sugar originally grew on land; cleared 50 or 60 years; soil, dark brown; subsoil, light brown; level terrace; rotation of tobacco, corn, and wheat; some manure applied, some fertilizer, no lime; red clover does well. This should be a typical sample of tobacco soil. Grows best quality Burley of reddish yellow color.

76-A.—Discard, 1.40%. South of barn; cleared 75 years; soil, gray; subsoil, yellowish; level terrace; rotation of corn, oats, wheat, and timothy; some manure applied, not much, no fertilizer, no lime; no legumes grown; red clover does not do well; poverty grass and mint, the principal weeds. This soil is very unproductive at present. It is covered with poverty grass although it has been sown to timothy.

77-A.—Discard, 1.38%. Soil, light gray; subsoil, bluish; level terrace; no drainage; no rotation; oats poor crop; no manure applied, no fertilizer, no lime; no legumes grown; red clover does not do well; land seriously in need of drainage; quite flat; this sample typical of large area of this kind of land.

78-A.—Discard, 1.76%. Soil, light red; subsoil, yellowish; corn and timothy grown.

79-A.—Discard, 1.69%. West of house; cleared 50 years; soil, brown; subsoil, light brown; level terrace; rotation of wheat, corn, and timothy, mostly wheat; not much manure applied, no fertilizer, one application 2000 pounds CaCO_3 ; no legumes grown lately; red clover does not do very well.

80-A.—Discard, .84%. East of barn; cleared 75 years; soil, dark gray; subsoil, light gray; level overflow; rotation of corn, wheat, and timothy; manure applied occasionally, fertilizer occasionally, one application of lime last year; clover grown; red clover does fairly well.

81-A.—Discard, 15.75%. North of barn; oak, hickory, beech, and walnut originally grew on land; cleared 10 years; soil, dark brown; subsoil, yellow; rolling highland; drainage, natural; rotation of corn, oats, and clover; 40 bushels corn, 50 bushels oats, 1½ tons clover; bluegrass predominates; no manure, no fertilizer, no lime; clover grown; red clover does fairly well; milkweed, briers, and whitetop, the principal weeds.

82-A.—Discard, 2.03%. North of house; cleared 50 years; soil, light red; subsoil, light red; rolling highland; rotation of corn, wheat, and timothy; yield not very high; no manure applied, no fertilizer, no lime; no legumes grown.

83-A.—Discard, 2.05%. North of barn; heavily manured; this sample is typical but has been heavily manured and is underlain with mussel shells evidently left by Indians.

84-A.—Discard, 1.46%. Cleared probably 100 years; soil, light gray; subsoil, yellowish; level terrace; rotation of corn, wheat, and timothy; very little manure applied, no fertilizer, no lime; red clover does not do well; typical of soils in Teays Valley; soil covered with cinquefoil; very little grass.

85-A.—Discard, 1.21%. Hickory originally grew on land; cleared 100 years; soil, dark gray; subsoil, yellow and blue; artificial drainage; before draining, swampy; meadow up to 20 years ago; 3 tons hay; 80 bushels corn; 5 applications of 8 tons of manure, 2500 pounds acid phosphate; limed, 1 ton CaO per acre; clover and cowpeas, mostly clover; red clover does well; some sorrel. This sample represents the flat land.

86-A.—Discard, 4.16%. North of buildings; oak, walnut, and sycamore originally grew on land; cleared 50 years; soil, black; subsoil, olive; level overflow; artificial drainage needed; no rotation in old meadow; consists of yarrow, daisy, poverty grass, and is a typical "run down" meadow.

87-A.—Discard, 8.48%. South of barn; oak, chestnut, and some poplar originally grew on land; cleared 75 years; soil, light brown; subsoil, yellowish; rolling highland; drainage, natural; corn, wheat, largely grass; sorrel, briers, etc., predominate; no manure applied, no fertilizer, no lime; no legumes grown; red clover does not do well; rock close to surface.

88-A.—Discard, 1.88%. Poplar, beech, and sugar originally grew on land; cleared 50 years; soil, brown; subsoil, brown; level overflow; artificial drainage; mostly meadow,

some corn and some oats; 75 bushels corn; a little manure applied, a little fertilizer, a little lime; no legumes grown; limestone on tops of hills in small amounts.

89-A.—Discard, 2.77%. South of house; oak, hickory, and walnut originally grew on land; cleared 100 years; soil, dark brown; subsoil, chocolate; rolling highland; drainage, natural; rotation of corn, oats, and clover; 50 bushels corn, 40 bushels oats, 1 ton hay.

90-A.—Discard, 7.31%. East of barn; sugar trees originally grew on land; cleared 100 years; soil, dark brown; subsoil, yellowish; rolling highland; drainage, natural; pasture more than $\frac{1}{2}$, farmed 12 or 15 years; 60 bushels corn, 2 tons soybean hay; only 1 application of manure, 4 or 5 applications 250 pounds phosphate; limed once, 1 ton CaO ; 2 crops soybeans, 1 crimson clover; red clover does well; sorrel, the principal weed. This sample represents the hill land under cultivation.

91-A.—Discard, 9.88%. Northeast slope, oak originally grew on land; cleared 75 years; soil, light brown; subsoil, yellowish; rolling highland; drainage, natural; mostly grass and pasture; poverty grass predominates; no manure applied, no fertilizer, no lime; no legumes grown; red clover does not do well; sorrel, the principal weed; typical poverty grass, northeastern slope.

92-A.—Discard, 10.42%. Northwest slope; walnut and poplar originally grew on land; cleared 75 years; soil, dark brown; subsoil, yellowish; rolling highland; drainage, natural; bluegrass and poverty grass predominate; no manure applied, no fertilizer, no lime; no legumes grown. This is same soil as 91-A, that is, it is derived from the same rock but has northwestern exposure instead of northeastern.

93-A.—Discard, .76%. South of barn; pine land; cleared 100 years; soil, grayish; subsoil, yellowish; under cultivation, corn, wheat, and timothy; no manure applied, no fertilizer; 2000 pounds CaCO_3 applied; soybeans grown; red clover does well; sorrel, the principal weed; this sample from farm which has been farmed for 100 years and is just now being well farmed.

94-A.—Discard, 1.01%. Northeast of barn; soil, grayish; subsoil, light gray; level terrace; rotation of corn, wheat, and timothy; little manure applied, no fertilizer; no legumes grown.

95-A.—Discard, 2.20%. Near barn; cleared 100 years; soil, chocolate; subsoil, yellowish; level terrace; in grass for years, farmed to alfalfa and corn; excellent corn crop now; bluegrass predominates; some manure applied, some acid phosphate, two applications of lime for alfalfa; alfalfa and red clover grown; red clover does well; this has probably been influenced by limestone from adjacent hill in which there is thin ledge. This had been bluegrass pasture for years.

96-A.—Discard, 1.04%. Oak, sycamore, and sugar originally grew on land; cleared 85 years; soil, reddish; subsoil, chocolate; level overflow; drainage, natural; rotation of corn, oats, and grass; 70 bushels corn; very little manure applied, some fertilizer, 1 ton lime per acre. The soil has been filled in largely the last ten years by overflow.

97-A.—Discard, 1.96%. Top of hill back of barn; cleared 50 years; soil, whitish; rolling highland; drainage, natural; hay grown; timothy predominates; acid phosphate applied; sorrel, the principal weed; land practically bare when Mr. Hardman bought it; treated with acid phosphate and got good crop of timothy.

98-A.—Discard, 1.11%. Sugar and oak originally grew on land; cleared 100 years; soil, light brown; subsoil, yellowish; level terrace, corn and wheat for years, under cultivation $\frac{3}{4}$ of 100 years; 50 bushels corn; 4 or 5 applications of manure, 4 or 5 small applications of fertilizer, limed twice; clover grown; red clover does fairly well; considerable plantain.

99-A.—Discard, 5.71%. Next creek; oak and hickory originally grew on land; cleared 50 years; soil, chocolate; subsoil, yellow; rolling terrace; drainage, natural; no rotation practiced; poverty grass, briars and redtop predominate.

100-A.—Discard, 1.40%. West of barn; land originally swamp; soil, black; subsoil, black; level overflow; artificial drainage 35 years ago but re-drained the last few years; grass, corn now; no manure applied, no fertilizer, no lime; no legumes grown.

101-A.—Discard, 2.25%. Soil, black; subsoil, yellowish; soil good for corn but unsatisfactory for grass.

102-A.—Discard, 1.05%. West of house; cleared 100 years; soil, reddish; subsoil, reddish; level overflow; drainage, natural; rotation of corn, wheat, timothy, and some clover; manure applied occasionally, some fertilizer, no lime; clover

grown occasionally; red clover does fairly well; this represents a flat field which overflows yearly or nearly that often; nice bottom field.

103-A.—Discard, 1.21%. Southeast of barn; sugar trees originally grew on land; cleared 10 years or so; soil, dark gray to brown; subsoil, brown; level overflow; no drainage; grass and pasture; no manure applied, no fertilizer, no lime; no legumes; some limestone upstream.

104-A.—Discard, 12.56%. East of house; cleared 50 years or more; soil, brown; subsoil, yellowish; land in grass; 5 acres or more to a steer; poverty grass and such grasses predominate; no manure applied, no fertilizer, no lime; no legumes grown; red clover does not do well; has been in meadow and pasture and nothing ever done but mow hay and pasture.

105-A.—Discard, 1.50%. Southwest of barn; white oak originally grew on land; cleared 75 years; soil, gray; subsoil, yellowish; rolling highland; drainage, natural; rotation of corn, wheat, timothy, and oats; some manure applied, very little, no fertilizer, no lime; legumes grown very little; red clover does not do well; poverty grass and wire grass, the principal weeds; this is typical of rather white soil of Jackson County.

106-A.—Discard, 1.07%. East of barn; white oak originally grew on land; soil, light brown; subsoil, yellowish; rolling terrace; drainage, natural; soil in poor shape and has not been well farmed for years.

107-A.—Discard, 7.40%. Southeast of barn; oak and pine originally grew on land; cleared 75 years, second growth until 5 years ago; soil, grayish; subsoil, yellowish; rolling highland; corn, wheat, and timothy years ago; some fertilizer applied, no lime; Legumes do not grow well; red clover does not do well; sorrel, poverty grass, pennyroyal, and cinquefoil, the principal weeds; has been farmed for years and then allowed to grow up to underbrush.

108-A.—Discard, 1.20%. Northeast of house; oak originally grew on land; cleared 12 years; soil, gray; subsoil, yellowish; level highland; drainage, natural; orchard; no manure applied, no fertilizer, no lime; red clover does well; sorrel, the principal weed.

109-A.—Discard, 6.19%. North of church; oak and chestnut originally grew on land; cleared 75 to 100 years; soil,

grayish; subsoil, yellow; rolling highland; drainage, natural; rotation of corn, oats, wheat, and timothy; very little manure applied, a little fertilizer, no lime; no clover ever sown, do not know if red clover does well; cinquefoil, sorrel, and poverty grass, the principal weeds; this sample chosen from poorly farmed area now in meadow adjoining the church yard.

110-A.—Discard, 1.03%. Poplar originally grew on land; cleared 75 years; soil, chocolate; subsoil, chocolate; level terrace; drainage, natural; corn, wheat, and timothy, is now in watermelons; some manure applied, no fertilizer, no lime; legumes not grown to amount to anything; red clover does not do very well. This is excellent and typical watermelon soil.

111-A.—Discard, 2.45%. West of town; soil, yellowish brown; drainage, natural; covered with very poor wheat; probably never had any lime or fertilizer and very little manure.

112-A.—Discard, 2.31%. Poplar, sugar, and oak originally grew on land; cleared 100 years; soil, red; subsoil, red; rolling highland; drainage, artificial; alfalfa, cowpeas, clover several times; 3 tons alfalfa, 75 bushels corn; manured 7 or 8 times, 3000 pounds acid phosphate, 3 tons CaO last 10 years; red clover does well.

113-A.—Discard, 3.61%. West of barn; chestnut originally grew on land; cleared 75 or 100 years; soil, light brown or gray; subsoil, yellowish; rolling terrace; drainage, natural; briars and broomsedge, corn this year; one application of manure, two or three applications of fertilizer, no lime; no legumes grown.

114-A.—Discard, 13.51%. West of house; white oak originally grew on land; cleared 25 years; soil, light gray; subsoil, yellowish; level highland; rotation of corn, oats, and timothy; acre yield not very high; 2 or 3 applications of manure, 1 application of fertilizer, 1 ton CaO applied; some clover grown, now ready for alfalfa; red clover does not do very well. The surface was covered with fragments of sandstone.

115-A.—Drainage, artificial; rotation of corn, oats, wheat, clover, and timothy; for yield see Ohio circular 144; analysis, Ohio bulletin 261; 6 inches surface soil; phosphorus, 664; potassium, 33,110; nitrogen, 1778; humus, 18800; calcium, 4720; magnesium, 7778. This soil corresponds to soil on plots in five-year rotation which has never received any fertilizer or manure since the experiments were begun in 1893.

INTERPRETATION OF ANALYSES.

Nitrogen, phosphorus, and potassium are three elements of plant food which may be present in available forms in such small amounts in the soil as to be limiting factors in crop production. The foregoing analyses show the total number of pounds of these elements present but not the number of pounds which are available. It is recognized that the amount of available plant food materials in the soil is determined by three things:

1. The total amount of these elements present in the soil.
2. The extent to which organic matter is incorporated with the soil.
3. The extent to which the soil can be kept supplied with carbonate of lime in order that the normal processes of decay may take place readily.

If two soils were equally supplied with organic matter and limestone, and one of these soils contained twice the amount of nitrogen, phosphorus or potassium as did the other, it seems reasonable to believe that the one containing twice the total amount of these elements would also be able to supply the crop being grown with twice the amount of these elements in available form.

In considering the subject of soil fertility from the long time point of view it seems desirable, therefore, to know the total amounts of nitrogen, phosphorus and potassium, the amount of organic matter and the amount of carbonate of lime present in the soil. Knowing these things, we can plan ahead more intelligently as to how to proceed toward a permanent system of soil building.

Table IV shows the average of all the analyses of West Virginia soils so far made. The amount of organic matter is calculated by multiplying the total carbon by 1.724 which would mean that organic matter was 58% carbon. The limestone requirement indicates the number of pounds of limestone necessary to destroy all the acid in the surface soil to plow depth. For most crops it is desirable to have the soil well supplied with limestone.

TABLE IV.—Pounds per 2,000,000 Lbs. of Surface Soil.

| | Highest | Lowest | Average of All Soils | Plot 21, Exp. Sta. Farm |
|-----------------------------|---------|--------|-------------------------|----------------------------|
| Nitrogen | 6,485 | 1,035 | 2,915 | 1,830 |
| Phosphorus | 3,635 | 355 | 1,095 | 590 |
| Potassium | 143,000 | 1,200 | 30,610 | 24,200 |
| Organic matter | 302,800 | 26,200 | 57,800 | 36,500 |
| Limestone requirement | 6,800 | 0 | 2,170 | 2,800 |

A study of the analyses of these soils will show that many of them are seriously depleted of phosphorus, nitrogen, and organic matter. Over 90% of the soils of West Virginia show a need of lime. Most of the soils are fairly well supplied with potassium.

We prefer to wait until more analyses have been made before discussing these analyses in detail. However, Table IV also gives the analysis of one of the check plots on the Experiment Station farm at Morgantown, and this shows that the average West Virginia soil so far analyzed is better than that on the Experiment Station farm. But a careful study of the analyses will show that many of the soils of the state would probably respond to fertilizer treatment much the same as does the soil on the Experiment Station farm.*

*See "Experiments with Fertilizers," Bulletin 155, West Virginia Agricultural Experiment Station.

